AMC-S402

Installation and Use

6806800H60A

March 2009

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Contact Address

Emerson Network Power - Embedded Computing
2900 South Diablo Way, Suite 190
Tempe, AZ 85282
USA

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Preface

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

The safety precautions listed below represent warnings of certain dangers of which Emerson is aware. You, as the user of the product, should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

GROUND THE INSTRUMENT. To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. If the equipment is supplied with a three-conductor AC power cable, the power cable must be plugged into an approved three-contact electrical outlet, with the grounding wire (green/yellow) reliably connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards and local electrical regulatory codes.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE. Do not operate the equipment in any explosive atmosphere such as in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment could result in an explosion and cause injury or damage.

KEEP AWAY FROM LIVE CIRCUITS INSIDE THE EQUIPMENT. Operating personnel must not remove equipment covers. Only Factory Authorized Service Personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment. Service personnel should not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, such personnel should always disconnect power and discharge circuits before touching components.

USE CAUTION WHEN EXPOSING OR HANDLING A CRT. Breakage of a Cathode-Ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, do not handle the CRT, and avoid rough handling or jarring of the equipment. Handling of a CRT should be done only by qualified service personnel using approved safety mask and gloves.

DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT. Do not install substitute parts or perform any unauthorized modification of the equipment. Contact your local Emerson representative for service and repair to ensure that all safety features are maintained.



OBSERVE WARNINGS IN MANUAL. Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.

To prevent serious injury or death from dangerous voltages, use extreme caution when handling, testing, and adjusting this equipment and its components.

Flammability

All Emerson PWBs (printed wiring boards) are manufactured with a flammability rating of 94V-0 by UL-recognized manufacturers.

EMI Caution

This equipment generates, uses, and can radiate electromagnetic energy. It may cause or be susceptible to electromagnetic interference (EMI) if not installed and used with adequate EMI protection.

Safety Statement

The AMC-S402 is designed to comply with UL60950-1, and is intended to be used with similarly tested ATCA and MicroTCA products that have a user’s guide detailing user installation of AMC module accessories.

CE Notice (European Community)

Emerson products with the CE marking comply with the EMC Directive (89/336/EEC). Compliance with this directive implies conformity to the following European Norms:

- EN55022 “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment”; this product tested to Equipment Class A
- EN50082-1:1997 “Electromagnetic Compatibility—Generic Immunity Standard, Part 1. Residential, Commercial and Light Industry”

System products also fulfill EN60950 (product safety), which is essentially the requirement for the Low Voltage Directive (73/23/EEC).

Board products are tested in a representative system to show compliance with the above mentioned requirements. A proper installation in a CE-marked system will maintain the required EMC/safety performance.

In accordance with European Community directives, a “Declaration of Conformity” has been made and is on file within the European Union. The “Declaration of Conformity” is available on request. Please contact your sales representative.

About This Manual

The AMC-S402 *Advanced Mezzanine Card SAS Hard Drive (HD) Carrier Installation and Use* includes an explanation on how to configure and install the product, and also includes programming information. Readers will also find functional descriptions of the major components, pin assignments for the major connectors and headers on the AMC-S402.

How This Manual is Organized

This manual is divided into the following chapters and appendices:

Chapter 1 AMC-S402 Overview includes a description of the product, a list of features, I/O interfaces, a block diagram, a list of other equipment required; dip switch settings, and installation instructions.

Chapter 2 AMC-S402 Installation provides detailed instructions for installing the AMC-S402.

Chapter 3 Functional Description describes the major functional features and capabilities of the AMC product. It includes a detailed list of features, I/O interfaces, a block diagram, and configuration options.

Chapter 4 Connector Pin Assignments includes pin out descriptions for all of the major headers and connectors on the AMC-S402

Chapter 5 Specifications contains basic environmental and mechanical specifications for this product.

Chapter 6 Front Panel Indicators contains the descriptions of the Front Panel LED indicators

Chapter 7 IPMI Functions List contains a listing of current IPMI functions supported by the carrier board and Standard and OEM commands.

Chapter 8 IPMI Firmware Upgrade Procedure describes the utility to upgrade the firmware.

Conventions Used in This Manual

The following typographical conventions are used in this document:

Table 1 Conventions Used In This Manual

Convention	Is used for
bold	User input that you type just as it appears; it is also used for commands, options and arguments to commands, and names of programs, directories and files.
italic	Names of variables to which you assign values, for function parameters, and for structure names and fields. Italic is also used for comments in screen displays and examples, and to

	introduce new terms.
courier	System output (for example, screen displays and reports), examples, and system prompts.
<Enter>, **<Return>** or **<CR>**	The carriage return or Enter key.
CTRL	The Control key. Execute control characters by pressing the CTRL key and the letter simultaneously, for example, Ctrl+D.

Hardware Preparation and Installation

Unpacking Instructions

If the shipping carton is damaged upon receipt, request that the carrier's agent be present during the unpacking and inspection of the equipment.

Unpack the equipment from the shipping carton. Refer to the packing list and verify that all items are present. Save the packing material for storing and reshipping of equipment.



Avoid touching areas of integrated circuitry. Static discharge can damage circuits.

After removing the product from the packaging:

- Check for obvious physical damage.
- Make sure that you disconnect the chassis from the main power supply before you continue.

Antistatic Precautions



Emerson strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading a system. Electronic components, such as disk drives, computer boards, and memory modules, can be extremely sensitive to electrostatic discharge (ESD). After removing the component from its protective wrapper or from the system, place the component flat on a grounded, static-free surface (and, in the case of a board, component side up). Do not slide the component over any surface.

If an ESD station is not available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores) that is attached to an active electrical ground. Note that a system chassis may not be grounded if it is unplugged.



Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.



Avoid touching areas of integrated circuitry. Static discharge can damage these circuits.

1 AMC-S402 Overview

The AMC-S402 is an Advanced Mezzanine Card (AMC) module which incorporates an enterprise class dual port SAS disk drive onto the module. The module boasts several unique features intended to help embedded systems designers address both thermal and signal integrity design challenges associated with in-chassis ATCA and MicroTCA applications.

The AMC-S402 includes new signal integrity 'tuning' circuits to adjust and optimize the high speed SAS serial links to best match the electrical routing environment of your specific ATCA or microTCA backplanes. These signal wave-shape parameters are stored in non-volatile memory installed on the module.

The AMC-S402 was developed as single-width AMC, with ship options for mid or full height panels. All hard drives are 2.5" small form factor, and spin at a minimum 10,000 rotations per minute (RPM). The AMC-S402 also includes a module management controller (MMC).

1.1 Features of the AMC Module

The AMC-S402 is an AMC module with the following major features:

- Accommodates a single 2.5" SAS hard drive
- Dual path SAS support, AMC Port 2 primary, AMC Port 3 secondary
- Drive over-current protection
- General Advanced Mezzanine Card Features
- Ejector switches for hot swap
- Wave shape capability, for SAS transmit signals
- One blue hot swap LED
- OOS (Out-of-Service) LED
- ACT LED indicates in-service state and I/O activity

Refer to Chapter 5 "Specifications" for additional details regarding environmental, mechanical, power specifications, as well as reliability and compliance statements.

1.2 PICMG Standards Compliance

The AMC-S402 is fully compliant with the following PCI Industrial Computer Manufacturers Group (PICMG) specifications:

- PICMG AMC.0 Rev2.0 (See section 5.1.1 for height exceptions)
- AMC.3 Revision 1. storage signaling option

1.3 Products Supported by this Manual

The information in this manual applies to the following Emerson products:

- AMC-S402-M-146G
- AMC-S402-M-300G

Figure 1. AMC-S402 Module Top View, Front Panel



1.4 Part Number, Serial Number Labels

At manufacturing time, identification labels are affixed to the AMC-S402 as shown below. For proper identification of the AMC module, use these barcode labels to accurately determine the module identity. The barcode labels provide the following information:

Table 2 AMC-S402 Identification Labels

Label	Description
Label 1: Final Assembly Number	For Internal Use Only
Label 2: Serial Number	Module Serial Number
Label 3: Sub-assembly Number	For Internal Use Only
Label 4: Part Numbers example: 0106825G02A AMC-S402-M-146G	This label contains 2 numbers: Top = Internal Part Number Bottom = Orderable Part Number

Label 5: UL recognition Label	Reviewed to 60950-1, (File E318926)

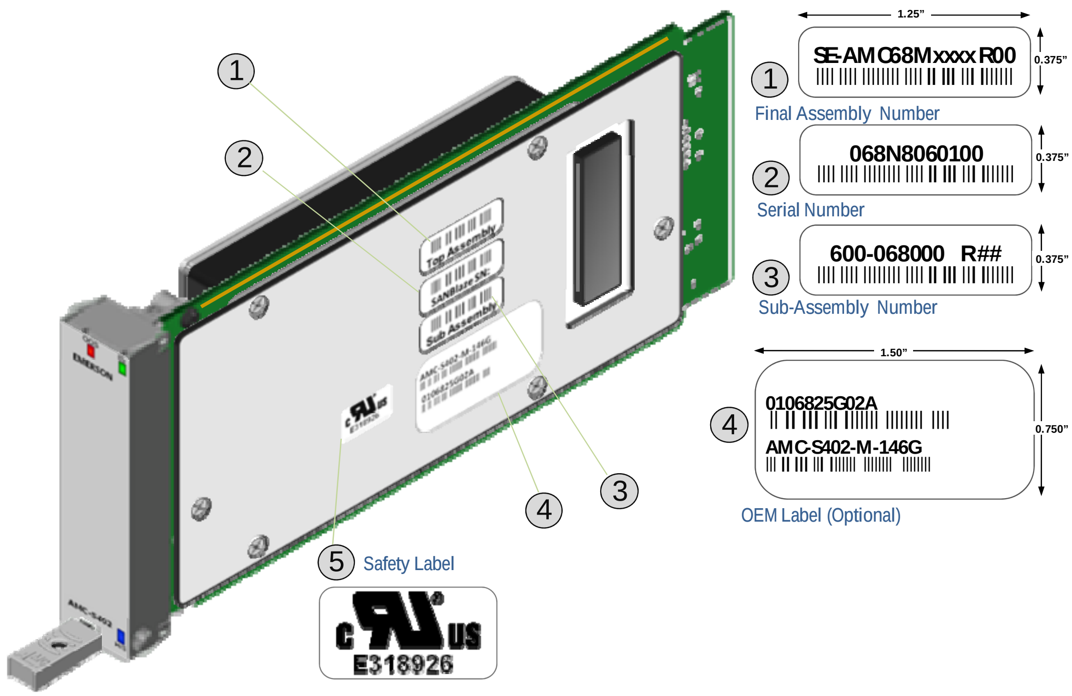


Figure 2. AMC-S402 Identification Labels

2 AMC-S402 Installation

This chapter contains the procedures for installing and removing the AMC-S402 AMC module.

2.1 Installation and Removal of the AMC-S402 Module

The AMC-S402 AMC Module can be installed into an ATCA shelf (chassis) with slots designed to accept AMC.3 installations. The module slot height must properly match the panel height fitted to the AMC.

2.2 Important Information about Your Chassis

The AMC-S402 is designed to PICMG specifications and is a general-purpose Advanced Mezzanine Card. Before using this board, review the specifications of the chassis and backplane that will house the module to determine the presence of, and any limitations of, chassis, IPMI bus, and user defined pin outs. For example, some chassis backplanes route certain I/O pins to internal resources such as alarm cards and drive resources. The AMC-S402 is intended for an ATCA AMC carrier card or MicroTCA chassis/backplanes/slots that are AMC.3 compliant. It is your responsibility to verify this system compatibility. Failure to do so could result in improper operation or equipment damage.

2.2.1 Safety Statement

The AMC-S402 is designed to comply with UL60950-1, and is intended to be used with similarly tested ATCA and MicroTCA products that have a user's guide detailing user installation of AMC module accessories.

2.2.2 Observe Maximum Module Current Requirements

Be sure to validate the host chassis, and the intended AMC slot is able to meet the following maximum current requirements

Table 3 Max AMC Module Current Requirements

Max current draw	AMC-S402
+12V (spin up < 100 µsec)	1.5A (18W)
+12v normal operating	0.9A (10.8W)
+12v (idle)	0.5A (6W)

2.3 Before You Install or Remove the AMC

Boards may be damaged if improperly installed or handled. Please read and follow the guidelines in this section to protect your equipment.

2.3.1 Observe ESD Precautions

Emerson strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading a system. Electronic components, such as disk drives, computer boards, and memory modules, can be extremely sensitive to electrostatic discharge (ESD). After removing the component from its protective wrapper or from the system, place the component flat on a grounded, static-free surface (and, in the case of a board, component side up). Do not slide the component over any surface.

If an ESD station is not available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores) that is attached to an active electrical ground. Note that a system chassis may not be grounded if it is unplugged.

2.3.2 Watch for Bent Pins or Other Damage

Bent pins or loose components can cause damage to the board, the backplane, or other system components. Carefully inspect your board and the backplane for both pin and component integrity before installation. Our suppliers take significant steps to ensure there are no bent pins on the backplane or connector damage to the boards prior to leaving our factory. Bent pins caused by improper installation or by boards with damaged connectors could void the warranty for the backplane or boards.

If a system contains one or more crushed pins, power off the system and contact your local sales representative to schedule delivery of a replacement chassis assembly.

2.4 Use Caution When Installing or Removing AMC

When first installing boards in an empty chassis or onto a carrier card, we recommend that you start at the left of the card cage and work to the right.

When inserting or removing a board in a slot adjacent to other boards, use extra caution to avoid damage to the pins and components located on the primary or secondary sides of the boards.

2.4.1 Preserve EMI Compliance

To preserve compliance with applicable standards and regulations for electromagnetic interference (EMI), during operation all front and rear openings on the chassis or board faceplates must be filled with an appropriate card or covered with a filler panel. If the EMI barrier is open, devices may cause or be susceptible to excessive interference.

2.4.2 Understand Hot Swap

Your AMC-S402 is electrically designed for hot swap within a fully powered chassis. To facilitate hot swap, there is a blue LED on the front faceplate. This LED is under software control.

If your system is using software that provides full hot swap capabilities, the software will illuminate the blue hot swap LED on the AMC faceplate when software has stopped and it is safe to remove the AMC module.

If your system does not have hot-swap aware software running, behavior of the blue LED is indeterminate. In this case, you may need to manually shut down applications or operating systems running on the board prior to board removal, even if the blue LED is lit.

Powering down or removing a board before the operating system or other software running on the board has been properly shut down may cause corruption of data or file systems.

2.5 Verify Slot Usage

Prevent possible damage to module components by verifying the proper slot usage for your configuration.

In most cases, electronic keying (E-keying) will prevent power on of a board into an incompatible slot. However, as an extra precaution, you should be familiar with the slot purpose.

2.6 Module Hot-Swap

This section describes a recommended procedure for installing a board module in a chassis. The AMC-S402 module has a latching mechanism. The latch mechanism includes the module handle with an integrated multi-position shaft and micro-switch.

The module handle is held in place by the faceplate, while the micro-switch is mounted on the module printed circuit board. The module handle is used to activate the micro-switch, which allows for hot swap switch as well as for extracting the module out of the connector and the AMC bay.

There are 3 positions of the Module Handle:

1. Pushed all the way in (IN) - When IN the module sends a signal to the Shelf Manager that the module is not in the hot-swap state and the Shelf Manager will communicate with the MMC. This is the position that the module handle should be in during normal operation.
2. Half Way (HW) - When the module handle is in the HW position, the Hot Swap switch is open and the MMC will send a Hot Swap event to the Shelf manager.
3. Out (OUT) - When the Module Handle is in the OUT position the latching mechanism is released and the module can be extracted.

The use of the Module Handle is used in conjunction with the Blue LED. Please refer to the text and table below for more detailed instructions on insertion and extraction.

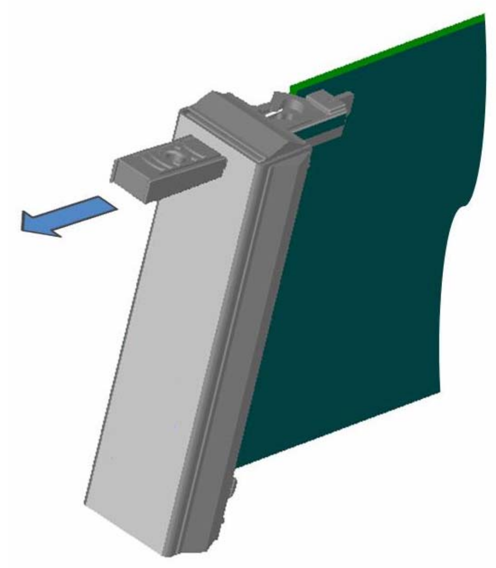


Figure 3. AMC Module Injector / Ejector Latch

2.7 Installing the AMC Module

This section describes a recommended procedure for installing a board module in a chassis.



Before you install your module, please read all cautions, warnings, and instructions presented in this section.

Handling modules and peripherals can result in static damage. Use a grounded wrist strap, static-dissipating work surface, and antistatic containers when handling and storing components.



Insert the board by holding the Module Handle—do not exert unnecessary pressure on the faceplate.

Hot swap compliant modules may be installed while the system is powered on. If a module is not hot swap compliant, you should remove power to the slot or system before installing the module.

1. Verify that you have taken the necessary antistatic precautions.
2. Inspect the ATCA carrier board or MicroTCA chassis, and locate the desired AMC slot.
3. Remove the slot filler panel from the selected AMC slot, if necessary.
4. Carefully align the edges of the module with the rail guides in the appropriate slot or carrier card.

5. Taking care to keep the module aligned in the guides, apply equal and steady pressure and slide the module in until the fingers of the module snap into the internal AMC connector.

   DO NOT FORCE THE BOARD INTO THE SLOT.

6. Push the Module Handle to the IN position.

7. Power on the system, if necessary. Refer to your system manual for instructions on correctly powering on the system. Once power is applied to the chassis, the internal MMC controller runs a self-test that runs for approximately 10 seconds. Upon a successful power up self-test, the blue hot swap LED will blink and then turn off, indicating that the module has been placed in operation.

2.8 Removing the AMC Module

The AMC-S402 AMC is hot-swappable and can be removed from the chassis without powering down the associated host carrier or chassis. This section describes the recommended procedure for removing an AMC module.

Caution

Before you remove your module, please read all cautions, warnings, and instructions presented in this section. Hot swap compliant modules may be removed while the system is powered on. If the chassis is not hot swap compliant, you should remove power to the slot or system before removing the module.

To remove the AMC module, follow these steps:

1. Begin to remove your module by pulling the module handle to the half way (HW) position. Do not remove the module immediately.

2. Powering down or removing a board before the operating system or other software running on the board has been properly shut down may cause corruption of data or file systems.

3. If your module is hot swap compliant and you are running fully functional hot swap-aware software, unlatching this ejector lever will start the shutdown process on the board. The software will slowly blink the blue hot swap LED indicating the module is in the process of being de-activated.

4. Once the module has been de-activated, the blue LED will solidly illuminate. Once this is done, you can extract the module by pulling on the module handle.

5. If your board or system is not running hot swap-aware software, the blue LED may illuminate without regard to software processes still running on the board. Be sure to manually shut down applications or operating systems running on the board prior to board removal.

6. Carefully pull the module from the chassis. If the card slot is to remain empty, install a filler panel in the slot.

3 Functional Description

This chapter provides a functional description of the major components and devices on the AMC-S402.

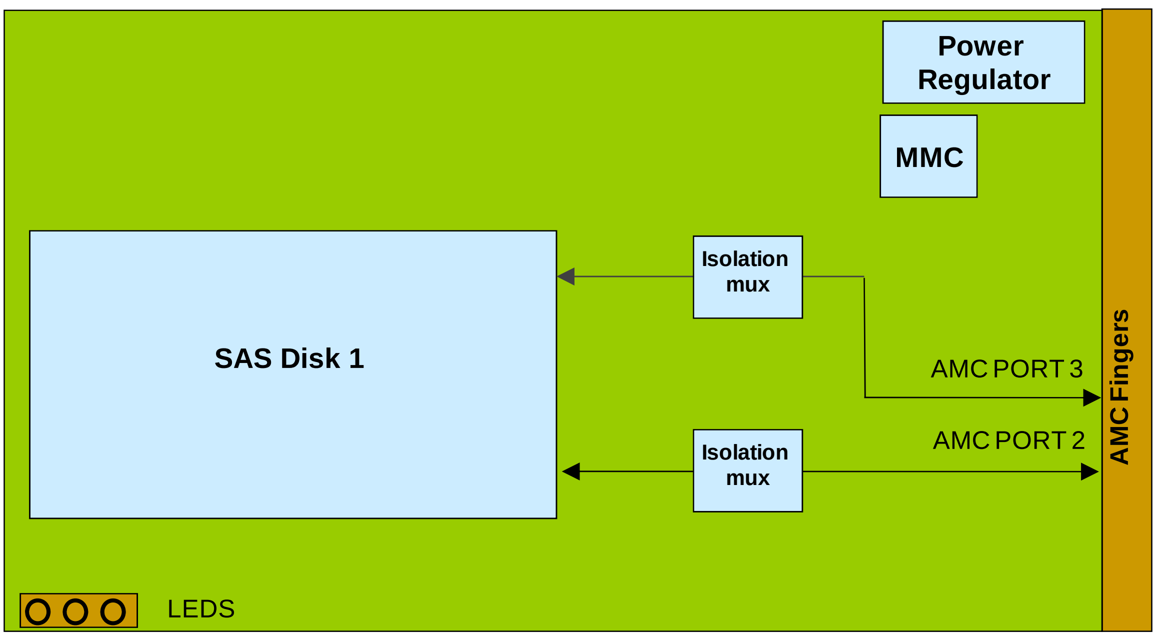
3.1 Overview

The AMC-S402 contains three major functional blocks. These are:

1. The Serial isolation multiplexor (mux) circuit
2. The Power Regulator, and the
3. The IPMI subsystem (MMC- module management controller)

The following block diagram illustrates the major components and their circuitry on the AMC-S402.

Figure 4. AMC-S402 Functional Blocks



3.2 AMC-S402, Top Level Board Layout

The AMC-S402 board layout is depicted in the figure below, and provides approximate physical location of major components.

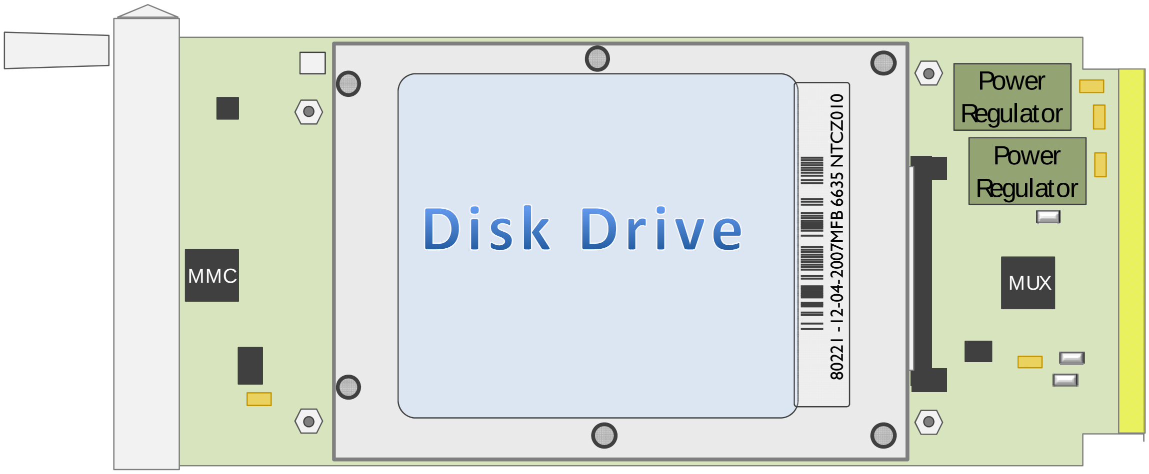


Figure 5. AMC-S402 Top Level Board Layout

3.3 Serial Storage I/O Interfaces

The AMC-S402 modules plug into ATCA carrier blades and uTCA backplanes which support AMC.3 storage signaling. Port 2 is wired to the SAS primary port and Port 3 is wired the SAS secondary port.

Table 4 I/O Ports Available On AMC Connector

AMC I/O	Description
Port 2	3Gb SAS Receive and transmit pairs, Primary port
Port 3	3Gb SAS Receive and transmit pairs, Secondary port
MMC device	Serial IPMI management bus

3.3.1 SAS Port Isolation Multiplexor Circuit

The AMC-S402 includes SAS re-transmitter circuits that can be used to adjust or "wave-shape" the transmit signal characteristics driven out the AMC finger connections (storage signaling ports 2 and 3). At manufacturing time, this circuit is pre-set to values that are optimal for the majority of deployments.

Programmable parameters include:

- transmit pre-emphasis (five levels)
- receiver equalization (three levels)
- Transmit output swing to support SAS up to 1600mV

Tools are available to adjust these circuits to accommodate atypical backplane or cable situations. Please contact your Emerson applications engineer if you feel your deployment will require different settings.

3.4 Power Regulator

The power regulator is the part of the module that generates the required power from the payload power (+12V) that is delivered to the module through the AMC connector.

This power is current limited by the onboard regulator.

3.5 IPMI Subsystem

The IPMI subsystem provides module management control (MMC) for the board. It is based on an Atmel microcontroller. Its function is to monitor module functions such as power, temperature, and hot swap requests via the ejector handle and report these to the base controller in the enclosure. It also stores information about the module including serial number and e-keying.

4 Connector Pin Assignments

This chapter provides connector pin assignments for AMC-S402. This module is AMC.3 compliant and uses Ports 2 and 3 as defined in the AMC.3 specification.

4.1 AMC-S402 Port Assignments

Below are the specific ports that are used by the AMC-S402. All other pins match the AMC.0 specification.

Table 5 AMC-S402 Port Assignments

Port	Signals
2	AMC.3 Serial Storage Port 2
3	AMC.3 Serial Storage Port 3

4.2 AMC Connector, “Finger” Assignments

The AMC-S402 includes an AMC connector, which conforms to the single slot B+ extended connector, with 170 signal contacts.

Table 6 AMC-S402 Module Edge, Pin Assignments

Pin#	Signal Name	Pin#	Signal Name
1	GND	86	GND
2	12V	87	No Connect
3	'PRSNT1_L'	88	No Connect
4	'AMC_VCC3'	89	GND
5	GA0	90	No Connect
6	No Connect	91	No Connect
7	GND	92	GND
8	No Connect	93	No Connect
9	12V	94	No Connect
10	GND	95	GND
11	No Connect	96	No Connect
12	No Connect	97	No Connect
13	GND	98	GND
14	No Connect	99	No Connect
15	No Connect	100	No Connect
16	GND	101	GND
17	GA1	102	No Connect
18	12V	103	No Connect
19	GND	104	GND
20	No Connect	105	No Connect
21	No Connect	106	No Connect
22	GND	107	GND
23	No Connect	108	No Connect
24	No Connect	109	No Connect
25	GND	110	GND
26	GA2	111	No Connect
27	12V	112	No Connect
28	GND	113	GND
29	'TX_SATA_2+'	114	No Connect
30	'TX_SATA_2-'	115	No Connect
31	GND	116	GND
32	'RX_SATA_2+'	117	No Connect
33	'RX_SATA_2-'	118	No Connect
34	GND	119	GND
35	'TX_SATA_3+'	120	No Connect
36	'TX_SATA_3-'	121	No Connect
37	GND	122	GND
38	'RX_SATA_3+'	123	No Connect
39	'RX_SATA_3-'	124	No Connect
40	GND	125	GND
41	'AMC_ENABLE_L'	126	No Connect
42	12V	127	No Connect
43	GND	128	GND
44	No Connect	129	No Connect
45	No Connect	130	No Connect
46	GND	131	GND

Pin#	Signal Name	Pin#	Signal Name
47	No Connect	132	No Connect
48	No Connect	133	No Connect
49	GND	134	GND
50	No Connect	135	No Connect
51	No Connect	136	No Connect
52	GND	137	GND
53	No Connect	138	No Connect
54	No Connect	139	No Connect
55	GND	140	GND
56	'IPMI_SCL_L'	141	No Connect
57	12V	142	No Connect
58	GND	143	GND
59	No Connect	144	No Connect
60	No Connect	145	No Connect
61	GND	146	GND
62	No Connect	147	No Connect
63	No Connect	148	No Connect
64	GND	149	GND
65	No Connect	150	No Connect
66	No Connect	151	No Connect
67	GND	152	GND
68	No Connect	153	No Connect
69	No Connect	154	No Connect
70	GND	155	GND
71	'IPMI_SDA_L'	156	No Connect
72	12V	157	No Connect
73	GND	158	GND
74	No Connect	159	No Connect
75	No Connect	160	No Connect
76	GND	161	GND
77	No Connect	162	No Connect
78	No Connect	163	No Connect
79	GND	164	GND
80	No Connect	165	No Connect
81	No Connect	166	No Connect
82	GND	167	No Connect
83	'PRSNT0_L'	168	No Connect
84	12V	169	No Connect
85	GND	170	GND

5 Specifications

This chapter contains the environmental and mechanical specifications for the AMC-S402. The environmental specifications relate to and vary with the Hard Drive that the AMC-S402 is configured with.

5.1 Physical Characteristics

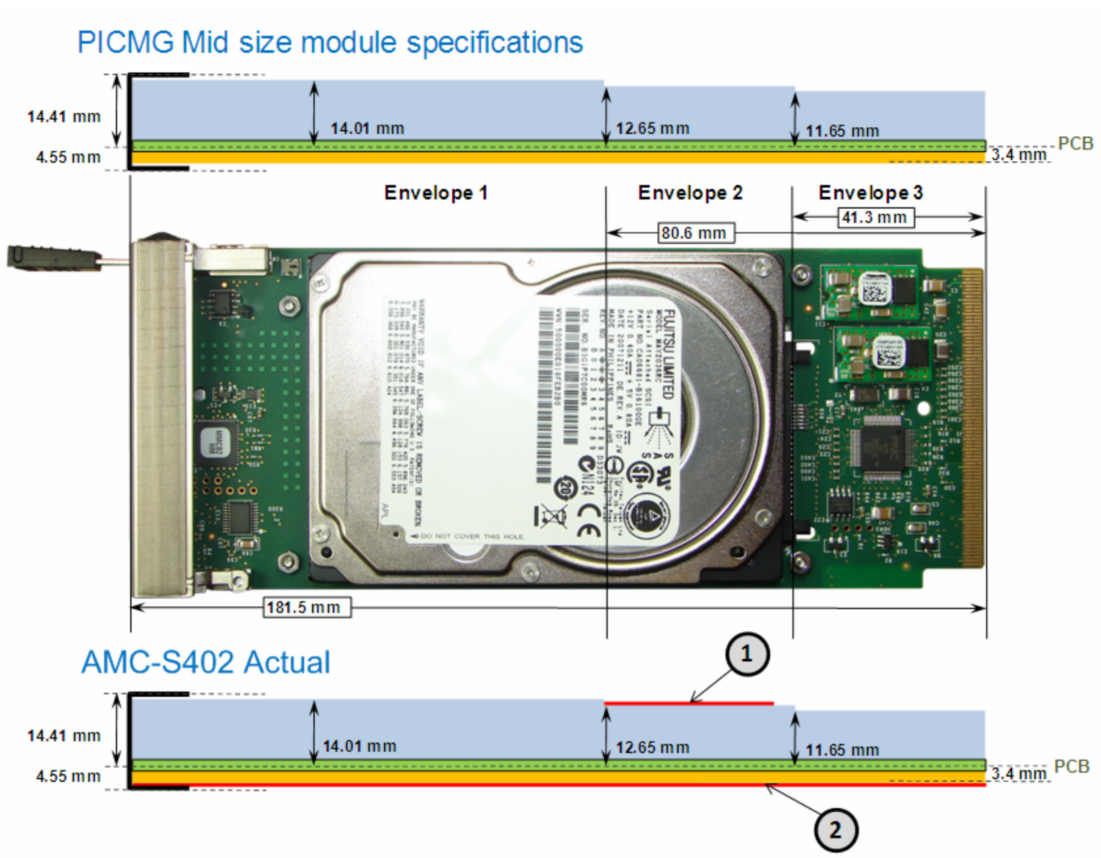
The AMC-S402 module board is 7.11 inches x 2.89 inches. The cards component height conformance is a function of the disk drive selected. Order options exist for mid or full height panels. (See section 1.3 Products Supported by this Manual).

5.1.1 AMC Module Height Exceptions

This module slightly exceeds the height profile dimensions listed in the AMC.0 specification. These exceptions are detailed below.

Table 7 AMC-S402 Module Height Details, No Heat Sink

item	Description	Dimension Delta
1	Maximum height, Envelope 2, Component side	+0.13mm exception (nominal), +0.33mm worst case
2	Maximum height, underside	+0.28mm exception (nominal), +1.0mm worst case



5.2 Hard Drive Operation and Storage Specifications

Table 8 Environmental Specifications, Sas Disk Drives

Specification		Enterprise SAS
Temperature	Operating (Ambient)	5 to 55ºC
	Disk enclosure surface	5 to 60ºC (Operating)
	Non-operating	-40 to 70ºC
	Gradient	3 ºC /min – (20 ºC /hour)
Relative humidity	Operating	5% to 95%
	Non-operating	5% to 95%
	Maximum wet bulb	29ºC (operating)
Vibration	Operating	1G (20 to 300Hz)
	Non-operating	5G (20 to 300Hz)
Shock	Operating	100 G / 1ms duration
	Non-operating	400 G / 1ms duration
Altitude	Operating	–1,000 to +10,000 feet
	Non-operating	–1,000 to +40,000 feet
Performance	RPM	10,000
	Seek time Avg	Read/write 4.5 ms (typical)
	Seek time Max	Read/write 9.0ms (typical)
	Interface	SAS 3.0Gb
	MTBF	725,000H

5.3 Power Requirements

The AMC-S402 shall consume no more than the following from the system supplies under normal operating conditions.

Table 9 Power Requirements

Part number	AMC-S402xxx
Management Power (MP)	100mA
+12V (spin up < 100	1.5A (18W)
+12v normal operating	0.9A (10.8W)
+12v (idle)	0.5A (6W)
OFF STATE	LESS THAN 0.4W

5.4 EMC Compliance

This product was tested in an EMC-compliant chassis and meets the requirements for EN55022 Class A equipment. Compliance was achieved under the following conditions:

- Conductive chassis rails connected to earth ground, providing the path for connecting shields to earth ground
- Front panel screws properly tightened

For minimum RF emissions, it is essential that the conditions above be implemented. Failure to do so could compromise the EMC compliance of the equipment containing the module.

Table 10 EMC Emission Compliancy

Description	Description
US: FCC 47 CFR Part 15 Class A	Yes, Class A emissions requirements (USA)
Canada: ICES 003 Class A	Yes Class A Digital Apparatus emissions (Canada)
Japan: VCCI Class A	Yes Class A ITE emissions requirements (Japan)
Europe Commercial: EN 55022:1994 Class A	Yes, Class A ITE emissions requirements (EU)
Europe Commercial: EN 55024:1998 Class A	Immunity for ITE equipment
Europe Commercial: EN 61000-4-2,3,5,6,8,11: 2001	EMC Electrostatic discharge immunity
Europe Commercial: EN 61000-4-4: 2000 (Limits for harmonic current emissions)	Yes
Europe Commercial: EN 61000-3-2,3	Yes, Limits for harmonic current emissions
Europe Telecom Carrier: EN 300-386 v1.3.3 April 2005	Requirements for Telecom Network Equipment – Non-Telco Centers
Europe CE Mark	Yes
Australia: AS/NZS 3548 C-Tick	Yes, Class A ITE emissions requirements (Australia)
South Korea: MIC	
Taiwan: BSMI	

6 Front Panel Indicators

The faceplate of the AMC-S402 module has three LED indicators. The figure and table that follows describes the function of each.

Figure 6. AMC Front Panel Indicators



Table 11 LED Function

Indicator	Color	State	Function
Hot Swap (HS)	BLUE	On	Management power available to the module and the module can safely be extracted
		Off	The module is operational and is unsafe for extraction
		Long Blink	Delay before module is activated
		Short Blink	Delay before module is de-activated
Fault or "Out of Service" (OOS)	RED	On	Module Fault set by Shelf manager or 12V payload power not detected.
		Off	No module fault 12V payload power is being supplied to board
Module In Service (IS)	GREEN	On	12V payload power is being supplied to board
		Blink	Indicates SAS disk I/O activity
		Off	12V payload power is not detected

7 IPMI Functions List

The AMC-S402 module employs a Module Management Controller (MMC) as specified in the AMC.0 specification. The MMC provides an Intelligent Platform Management Interface (IPMI) which will communicate with the ATCA and MicroTCA shelf managers. This MMC controls and monitors the following:

- Hot swap communication with the shelf manager
- Inlet air temperature
- Voltage monitoring
- Electronic keying as described in the AMC.0 specification
- FRU information
- Drives LED indicators for Hot Swap, In Service, and Out of Service

7.1 IPMI and Management Controller (IPMC)

The design features an IPMI controller consisting of a 16-bit microcontroller, flash and SRAM. The microcontroller uses I^2C interface to communicate the shelf management controller (ShMC), and sensors and MMC devices on AMC modules.

- An I2C connection provides the communication path between the MMC the temperature sensor. The I2C serial bus also routes to the SFP+ modules.
- Support hot-swap operation as defined for AMC modules in PICMG AMC.0 specification "Fail-safe flash update" - if interrupted at anytime, the MMC firmware is still able to respond and re-flash.
- "I2C hang recovery" - able to detect and recover from an I2C bus hang.

7.2 Sensor Data Records

The MMC monitors the status of the module and provides this data so the shelf manager can read it. Below are the SDRs that the AMC-S402 module creates.

Table 12 Sensor Data Records

Sensor	UNR	UC	UNC	LNC	LC	LNR	ID String
1.8V	1.98	1.93	1.90	1.70	1.67	1.62	+1.8V
5.0V	5.50	5.35	5.25	4.75	4.65	4.5	+5V
12V	13.60	13.40	13.00	11.00	10.60	10.400	+12V
Board Temp (LM60)	80	70	60	N/A	N/A	N/A	Board Temp
Inlet Temp (LM75)	70	60	50	N/A	N/A	N/A	Inlet Temp

The AMC-S402 includes the standard FRU data records per the IPMI Platform Management FRU Information Storage Definition, Board Info Area. The AMC-S402 includes additional FRU records as defined in the PICMG 2.9 specification.

Table 13 Example FRU Data Records

Board Information	AMC-S402-146G
Version	1
Language Code	25 (EN-English)
MFG date.time	See note *1
Manufacturer Name	Emerson
Product Name	AMC-S402-M-146G
Product Serial Number	068LYMMSSSS (See note *2)
Product Part / Model#	0106825G12A
Product Version	A

*1. Manufacturing time is defined as 'minutes since 1/1/96' in the IPMI FRU spec.

*2. Serial Number format: 068LYMMSSSS

068 = part code (denotes AMC-S402)

L= manufacturing location

Y=year (hex: 4=2004, 0=2010)

MM=month (hex: 01=JAN, 10=OCT)

SSSS=sequence number (0-9999)

7.2.1 AMC Port Assignments

The AMC-S402 connects up to two ports on the AMC connector. These are defined by the AMC.3 specification for serial storage. The link type and link type extension are defined in the table below.

Table 14 AMC-S402 E-Key Port Assignments

Port #	Port Name	Link type	AMC port map region
0	unused		
1	unused		
2	Channel 0	Link type 7 = AMC.3 Storage, Link type extension = 2 (SAS/SATA) AMC Asymmetric Match = 00b (SAS)	Common Options
3	Channel 1	Link type 7 = AMC.3 Storage, Link type extension = 2 (SAS/SATA) AMC Asymmetric Match = 00b (SAS)	Common Options
4-20	unused		

7.3 Supported IPMI Commands

The MMC communicates with the carrier controller through the local IPMB-L bus of the carrier and responds to all mandatory commands for AMC Module Management Controllers (as defined in the AMC Specification), as well as some optional ones.

Table 15 Supported IPMI Commands

Command	IPMI/PICMG/ AMC Spec	NetFn	CMD	MMC Req
IPM Device “Global” Commands				
Get Device ID	17.1	App	01h	Mandatory
Broadcast “Get Device ID”	17.9	App	01h	Mandatory
Messaging Commands				
Send Message	18.7	App	34h	Optional
Event Commands				
Platform Event	23.3	S/E	02h	Mandatory
Sensor Device Commands				
Get Device SDR Info	29.2	S/E	20h	Mandatory
Get Device SDR	29.3	S/E	21h	Mandatory
Reserve Device SDR Repository	29.4	S/E	22h	Mandatory
Get Sensor Reading Factors	29.5	S/E	23h	Optional
Set Sensor Hysteresis	29.6	S/E	24h	Optional
Get Sensor Hysteresis	29.7	S/E	25h	Optional
Set Sensor Threshold	29.8	S/E	26h	Optional
Get Sensor Threshold	29.9	S/E	27h	Optional
Set Sensor Event Enable	29.10	S/E	28h	Optional
Get Sensor Event Enable	29.11	S/E	29h	Optional
Rearm Sensor Events	29.12	S/E	2Ah	Optional
Get Sensor Event Status	29.13	S/E	2Bh	Optional
Get Sensor Reading	29.14	S/E	2Dh	Mandatory
FRU Device Commands				
Get FRU Inventory Area Info	28.1	Storage	10h	Mandatory
Read FRU Data	28.2	Storage	11h	Mandatory
Write FRU Data	28.3	Storage	12h	Mandatory
ATCA™ Commands				
Get PICMG Properties	3-9	PICMG	00h	Mandatory
FRU Control	3-22	PICMG	04h	Mandatory
Get FRU LED Properties	3-24	PICMG	05h	Mandatory
Get LED Color Capabilities	3-25	PICMG	06h	Mandatory
Set FRU LED State	3-26	PICMG	07h	Mandatory
Get FRU LED State	3-27	PICMG	08h	Mandatory
Get Device Locator Record ID	3-29	PICMG	0Dh	Mandatory
AMC® Commands				

Command	IPMI/PICMG/ AMC Spec	NetFn	CMD	MMC Req
Set AMC Port State	3-27	PICMG	19h	Mandatory
Get AMC Port State	3-28	PICMG	1Ah	Mandatory

8 IPMI Firmware Upgrade Procedure

This chapter provides the instruction for upgrading the IPMC (Intelligent Platform Management controller) firmware. If the AMC-S402 requires new firmware, an upgrade can be performed remotely using a LAN connection to the self manager.

8.1 The ipmitool utility

Firmware upgrades are accomplished with **ipmitool**, a utility for managing IPMI-enabled devices. The utility is an open source derivative which is modified by the shelf management supplier.

The AMC-S402 keeps a redundant copy of the firmware in the FLASH. Upgrades are reliable and reversible. A failure in the download (error or interruption) does not disturb the IPMC's ability to continue using the "old" firmware or its ability to restart the download process. The IPMC automatically fails back to the previous firmware if there is a problem when first running new code.

SYNOPSIS

The minimum information to complete a firmware upgrade is documented here.

$ ipmitool [-I|-H|-T|-B|-t|-b] hpm upgrade <*firmware_file*>
$ ipmitool [-I|-H|-T|-B|-t|-b] hpm activate

DESCRIPTION

ipmitool lets you manage Intelligent Platform Management Interface (IPMI) functions of either a local or remote system using IPMI V1.5 and IPMI v2.0. Capabilities include printing FRU information, LAN configuration, sensor readings, and remote chassis power control.

OPTIONS

Table 16 Ipmitool Options Relevant to Firmware Upgrades

Option	Description
-I <*interface*>	Selects IPMI interface to use. Supported interfaces that are compiled in are visible in the usage help output. Use **lan** to designate Ethernet.
-H <*address*>	Remote server address, can be IP address or hostname. This option is required for *lan* interfaces.
-T <*address*>	If updating an AMC, use to specify the address and Bus ID of the carrier that holds the AMC. These entries are not needed when updating the carrier alone.
-B <*bus id*>	
-t <*address*>	IPMB-L address of the target MMC or Carrier
-b <*bus id*>	Bus ID of the target MMC or Carrier (use 0 for a carrier, 7 for an AMC/RTM)

COMMAND SYNTAX EXAMPLES

EXAMPLE 1. The following example shows the command sequence for firmware upgrade of an AMC installed on a carrier:

```
$ ipmitool -I lan -H 192.168.0.2 -T 0x82 -B 0 -t 0x74 -b 7 hpm upgrade hpm1fw.img
$ ipmitool -I lan -H 192.168.0.2 -T 0x82 -B 0 -t 0x74 -b 7 hpm activate
```

Line 1 puts the new firmware in the flash device, where hpm1fw.img is the image. Line 2 is used to dynamically load and activate the new firmware.

EXAMPLE 2. The following example shows the command performing firmware upgrade on the carrier itself:

```
$ ipmitool -I lan -H 192.168.0.2 -t 0x82 -b 0 hpm upgrade hpm1fw.img
$ ipmitool -I lan -H 192.168.0.2 -t 0x82 -b 0 hpm activate
```

Line 1 puts the new firmware in the flash device, where hpm1fw.img is the image. Line 2 is used to dynamically load and activate the new firmware.